GEOPHYSICAL INSTITUTE *QUARTERLY*

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New Building an Investment in the Future

What's a good Alaskan investment?

An endeavor proven to put money into the state's economy—that's good.

An endeavor that puts money into the economy, and doesn't depend on Alaska's diminishing nonrenewable resources—that's better.

An endeavor that can do both and still yield a 400% return on the state's investment, encourage development of high-tech industry in Alaska, and educate a work force—that's better yet.

If that endeavor also conducts research to reduce risks to Alaskans from natural hazards, and improves the efficiency of governmental activity in a time of decreasing revenue, then it sounds too good to be true.

It's not.

These attributes easily can apply to a state investment in a building planned as an addition to the current home of the Geophysical Institute at the University of Alaska Fairbanks.

The 138,000-net-square-foot addition will contain laboratories and space for scientists to conduct the latest geophysical and environmental research alongside experts from state, federal, and private organizations. Such sharing of knowledge and resources yields increased efficiency, productivity, and success in research, in education, and in service to the state.

Ground breaking is scheduled for 1995, and the addition is to be completed by 1996. Recognizing the long lead time needed to design and construct the addition, UAF officials obtained support for the project from the Board of Regents and the Fairbanks North Star Borough two years ago.

Legislative approval came in early 1992, when funds were appropriated to conduct the preliminary design work. The final design work is in the hands of Kumin Associates, Inc., of Anchorage, and the institute now seeks $2 million from the state to make the project bid ready by 1994. The addition is to be constructed with a mix of federal, state, and private funds.

The Institute is Overcrowded

Even before approaching the Board of Regents, institute researchers had begun to search for more space.

Staff currently numbers around 300 and a growing number of graduate students vie with them for space in the C.T. Elvey Building, home of the Geophysical Institute. As a result, 25 laboratories and public rooms had to be converted to office space during the past few years. Laboratory space in the 22-year-old building now is extremely limited and does not comply with changes in health and safety codes.

Institute programs already have overflowed beyond the Elvey building. They occupy wet lab space and library storage in a building down the street, in two detached large cold storage buildings miles away, and in several storage and equipment trailers. Other library materials, data, and research equipment are stored in five classrooms at an unused school across town.

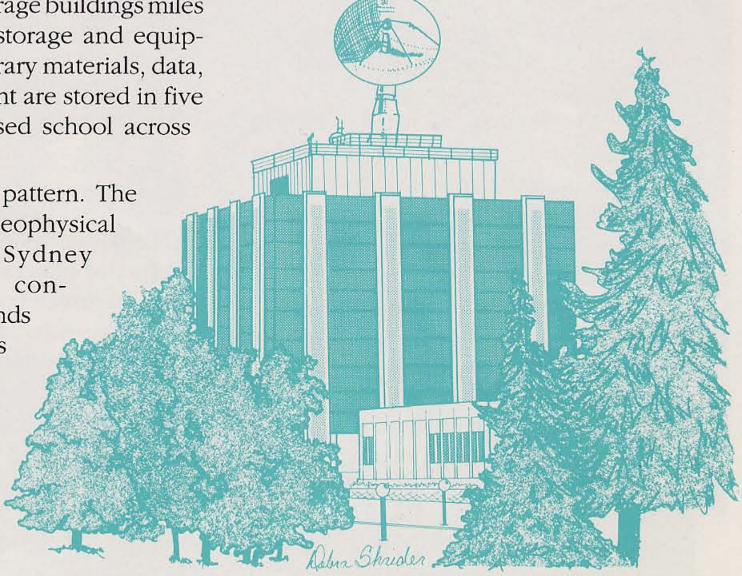
It's a long-standing pattern. The original home for the Geophysical Institute was the Sydney Chapman Building, constructed with federal funds in 1949. By the end of its 20-year span as home for the institute, that three-story building also was supplemented by a stack of trailers, storage and research facilities off campus and odd offices tucked away here and there.

Polar Research Has Grown

Part of the space crunch comes from the increasing number of graduate students studying at the institute (see GI Notes). However, the chief propulsive force comes from the successful aggressive pursuit of research for Alaska.

The institute was established by Congress in 1946 to conduct geophysical research in the polar regions. By the 1950s, it was internationally known for auroral research. With the successful 1957 flight of Russia's Sputnik, the federal government became acutely interested in the near-space environment in which institute researchers already specialized.

Increased federal funding enabled institute scientists to study geophysical processes occurring from the center of the earth to the center of the sun.



Investing in the Future

After the 1964 Great Alaska Earthquake, seismology and volcanology studies at the institute grew. Today, the Alaska Earthquake Information Center (AEIC) gets data from more than 120 remote seismic stations around the state, and the Alaska Volcano Observatory (AVO) helps predict volcanic eruptions in the Cook Inlet region, Alaska's most populous area and a major international air transportation hub. AVO also issues air plume advisories for commercial, private, and military pilots as well as informs government officials and the general public of potential hazards to health and property.

In keeping with the times, the institute expanded in 1988 to include the Alaska Synthetic Aperture Radar Facility (ASF) to conduct sophisticated remote sensing work. The big dish installed on the institute's roof to get data from satellites didn't displace anyone, but the computers, offices, and archives associated with ASF take up lots of room in the building.

The expansion of these combined activities has caused the Elvey building nearly to burst at its seams. ASF wasn't even conceived of when the Elvey building was designed and neither was AVO, AEIC, the Alaska Space Grant program, or the federal interest in global climate change studies, in which many institute researchers now are involved.

Good Return on State Investment

With all these projects on line, the Geophysical Institute's annual income reached about $20 million in 1992. That's a 400% return on the state's investment in institute operating funds, which has remained constant at about $4 million for several years. That means the institute generated $4 from external sources for every $1 invested by the state.

Currently, the institute receives 80% of its funding from external restricted research grants and contracts. In the last five years, it has more than doubled its externally funded research activity, growing at 19% annually.

It may be too much to expect that externally funded research activity at the institute will continue to grow at 19% per year, but it is not too much to expect that it will continue to grow. For more than a decade, federal funding for basic research in the physical and environmental sciences has increased an average of 5.5% annually, and the new Clinton administration supports environmental research.

If growth at the institute only matches the federal increase of 5.5% annual growth, a conservative estimate of the predicted average GI research income from 1996 through 2015 is about $68 million per year. If growth at the institute increases at 9% annually, the predicted average GI research income for the same period is about $112 million per year.

The most critical factor determining research growth at the institute is the availability of room in which to conduct it. Without the new addition, there is no room to expand and growth will stop.

Research Creates New Jobs

Research is a valuable asset for the state, especially now when Alaska seeks to diversify its economic base to dampen existing boom-and-bust cycles.

It's easy to see that Alaska benefits directly by research because it pumps millions of dollars into the state economy, and creates new jobs. In Fairbanks alone, the Community Research Center estimated that nearly 1500 jobs in the Fairbanks North Star Borough (about $40 million in salaries and about 6% of total employment in June 1991) were the result of research, mostly associated with the university.

Money from research moves around the state, and not just from the payroll packets of scientists. For example, a project in Kaktovik, barely underway, already has put more than $32,500 for goods and services into the local economy. Some North Slope villages will share in the $1 million a year to be generated over the next 10 years by a federal program to study clouds led by the institute. And Venetie and Arctic Village receive $11,000 annually simply for their combined permission to allow spent rocket motors shot off from Poker Flat Research Range to fall on their uninhabited land.

Fed, State, UAF Scientists Unite

The Geophysical Institute, already a productive generator of both money and practical research results for the state, will occupy more than half of the new addition. The rest will be taken up by other agencies with related mandates, which will further enhance institute productivity.

Interested agencies include the National Weather Service, the National Aeronautics and Space Administration (NASA), the National Science Foundation's Polar Ice Coring Office, the USGS divisions of Water, Mapping, and Geology, the US Department of Interior's Bureau of Mines, the US Park Service, Alaska's Division of Geological and Geophysical Surveys (DGGS), and the Alaska Aerospace Development Corporation.

The agencies in the addition will pay rent to the university, helping reduce overall expenses, and they'll share common support facilities, lowering the cost to each.

University groups that plan to expand part or all of their operations into the addition include AVO, AEIC, ASF, the Alaska Space Grant Program, the GI GeoData Center, NASA's Earth Observing Satellite Program, UAF's Supercomputing Center for user assistance and for data analysis, UAF's Center for Global Change, USGS's College Geophysical Observatory, the Department of Energy's Atmospheric Radiation Measurement Program, Poker Flat Research Range management offices, and the Brooks Range Sedimentary Geology Program for studying resources in the Arctic National Wildlife Refuge.

Streamlined Government

The benefits of collocation (the fashionable term for sharing quarters and ideas) include allowing organizations to share talent and expertise along with data, equipment, and laboratories.

In practical terms, collocation means working professionals will be in daily contact with professors conducting basic research. For example, climatologists at the institute can meet National Weather Service forecasters at the coffeepot instead of once every few months at a luncheon, and NWS meteorologists can hand carry a satellite image from ASF to the next office and say, "What do you make of this?" instead of driving all over town, first for the image, and then for expert advice on image analysis.

In the new addition, the NWS plans to work with the Geophysical Institute on a new program called COMET. The purpose of the institute project is to develop new techniques to accurately forecast lightning in Alaska, a needed breakthrough for forest fire fighters. And the NWS wants to work with institute researchers to look at real-time weather around the state with NEXRAD Doppler radar. Such up-to-the-minute weather reports will greatly enhance flight safety around Alaska.

When it comes to applied geophysical research, daily elbow rubbing to exchange information is almost a necessity. Geophysics means responding quickly to real-world environmental hazards from volcanoes to forest fires, from earthquakes to melting permafrost, from ice fog to oxyfuel, from blizzards to a potential arctic ozone hole.

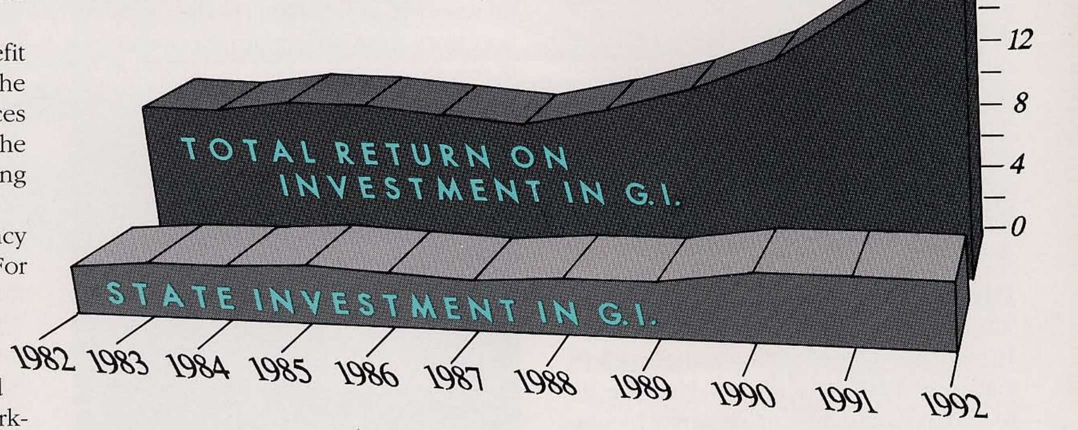
The University of Alaska will benefit from collocation in Kodiak, where the School of Fisheries and Ocean Sciences plans to share a new building with the National Marine Fisheries Service (among other possible tenants).

Not only does collocation have currency and logic, it also has a track record. For example, the Alaska Volcano Observatory is a cooperative program among the Geophysical Institute, USGS, and Alaska's DGGS. Every day USGS and DGGS personnel are in the institute, working, talking shop, listening, and learning.

Today, the Alaska Volcano Observatory and the Alaska Earthquake Information Center have reached a limit in development because of lack of room. Most USGS research on Alaska's volcanoes and earthquakes takes place outside the state, with USGS employees participating in seismic monitoring via computer. After the addition is built, more USGS staff will move to Fairbanks to work directly with the seismologists and volcanologists at the institute. The recent eruptions of Mount Spurr and Redoubt volcanoes amplify the urgency of such a move.

Collocation also will give the agencies an opportunity to work on joint projects together. For example, Congress has charged several federal agencies to study the water table. In the addition, the US Park Service, NWS, and USGS can tackle the problem together with Alaska's DGGS and university researchers. Similarly, the US Park Service wants to create a new glaciology research group to work with the Geophysical Institute's Snow, Ice and Permafrost departments and the USGS Water Division.

"GI is funded only in small part by the people of Alaska, but over the years it has brought hundreds of millions of dollars into the state."



New Opportunities for Alaska

Governmental agencies may not be the only ones to capitalize on collocation in the new addition. The launch of the first guided rocket from Poker Flat Research Range, and the $20 million upgrade of the range for research, may attract new high-tech commercial space business to Alaska.

Two private organizations already have expressed an interest in locating their operations in Fairbanks to launch lightweight microsatellites into polar orbit from Poker Flat.

Another space business wants to drop payloads containing commercial experiments out of orbit on Poker Flat land. The largest land-based rocket range in the world, Poker Flat has an established chain of downrange observing facilities from inland to the Arctic Ocean for monitoring and recovery purposes.

Soon Poker Flat will become part of an International Trade Zone in Fairbanks, offering further incentives to commercial businesses that want to move to Alaska.

The addition also some day may house a NASA Center for the Commercial Development of Space. These centers bring together university researchers and industry to encourage commercial space business. Seventeen such centers already exist at universities around the country.

Cooperation with commercial space business will encourage research expansion because university experiments could fly on commercial missions bound for outer space. Poker Flat, the only nonfederal, university-run range in existence, now is used mainly to launch rockets for auroral and middle- to upper-atmospheric research.

Educational opportunities for university students also will expand in the new addition, which will contain several classrooms, auditoria, meeting rooms, laboratories, study space, and an expanded library. Students are overcrowded in the current Elvey building, which only has one classroom and very limited space for student study and research.

In addition, sharing quarters with state, federal, and private agencies will give students the opportunity to learn from professors and professionals. For students, collocation means new training programs, new undergraduate courses, and internships.

While less formal in educational activities, most state and federal agencies already provide internships for students or hire them part-time. Such hands-on experience increases employment possibilities for students and encourages the development of a skilled work force in Alaska for Alaska.

School teachers, visitors, and the general public will benefit from collocation also. The second floor of the addition is dedicated to the dissemination of public services and visitor information. There, an information and visitor's center will explain the latest geophysical research using interpretive displays to show spectacular views of the aurora, glaciers, active volcanoes, and movements of the earth's crust, sea ice, and ocean currents.

This also means one-stop shopping for public services now spread around the state. For example, a business person needing information from the institute's Geo-Data Center, also can stop by the NWS forecast office, and pick up maps from USGS and DGGS—all in one stop.

Notes of Merritt

Associate Director for Institute Relations Merritt Helfferich lately has spent most of his waking hours working on the new building. His comments follow.

"In private industry, achievement of a company's goals and the creation of profit are the measures of success. In a public organization like the institute, success must be evaluated by how effectively it achieves its mission and by its efficiency in the use of public funds. The institute's mission is to understand the basic processes of the earth, especially as they are relevant to Alaska. It also is to train students for the jobs of the future, to solve applied geophysical problems, and to develop resource-oriented technology of importance to the state and to the nation. And it's to serve the intellectual and technological needs of Alaskans through its service to the public.

The institute's explosive growth over the past five years is a measure of its success in meeting these goals. It reflects the staff's aggressive competition for external funding and its appropriate geographic position. This growth occurred in direct competition with the best of the nation's universities.

The institute is now suffering from its success. It has outgrown its building. Expanded capabilities are needed to serve the developing international concern about the global environment, the new President's intention to cope with these problems, and Alaska's need to explore its natural resources and to develop new industry. An institute response will be impossible without additional and appropriate facilities.

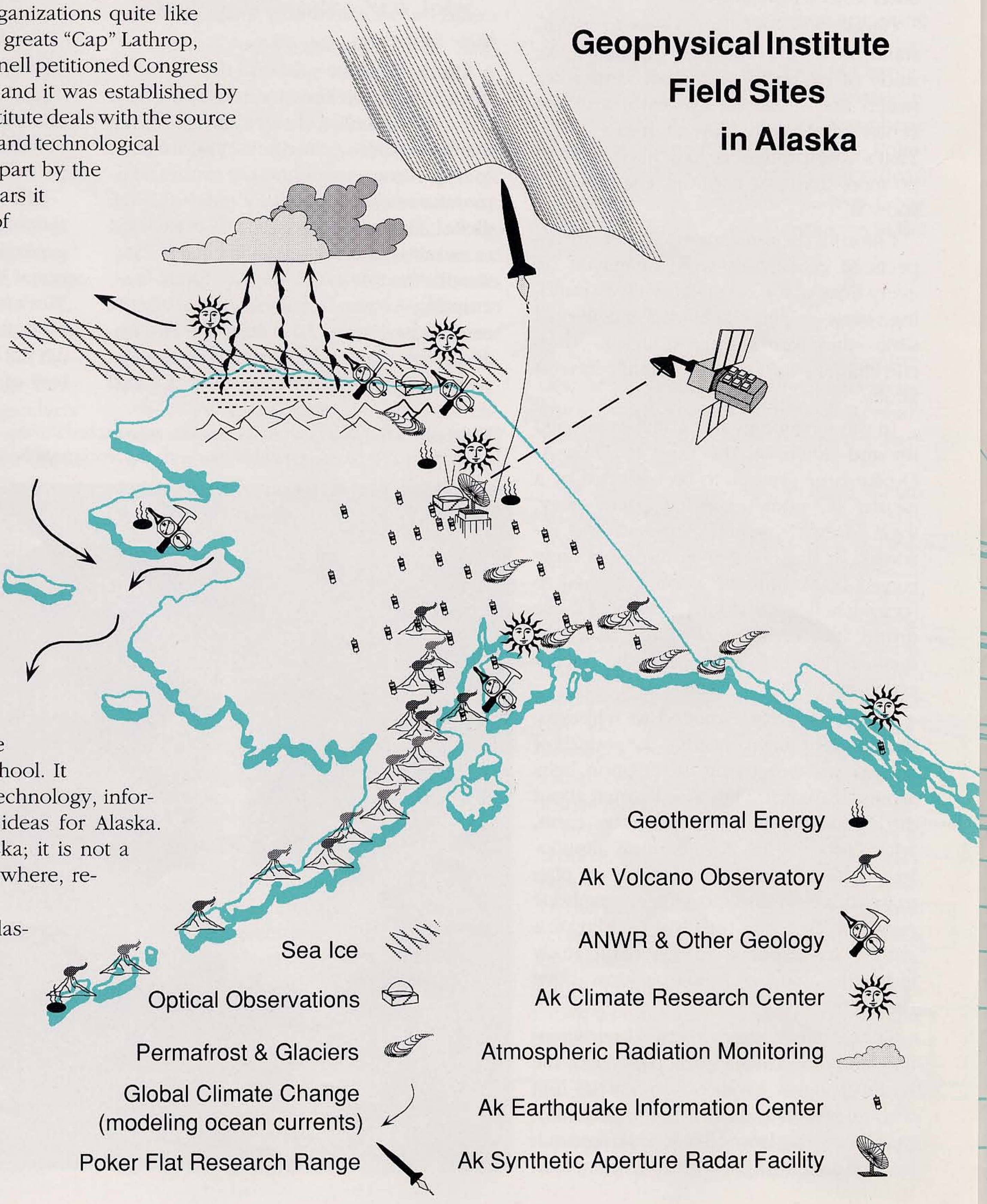
There are no other Alaskan organizations quite like the Geophysical Institute. Alaskan greats "Cap" Lathrop, Andrew Nerland, and Charles Bunnell petitioned Congress for its establishment in the 1930s and it was established by an Act of Congress in 1946. The institute deals with the source of America's wealth—its scientific and technological skills. GI is funded only in small part by the people of Alaska, but over the years it has brought hundreds of millions of dollars into the state. When a new contract or grant is received by the excellence of its work, the information discovered is available for use in Alaska, the students who work on the project are from the University of Alaska, and the salaries paid for the work are spent in local stores. It is a mecca for international scientists and an attraction for tourists.

The institute explores the bountiful resources of Alaska. It provides policy information to legislators, informs the public, assists the commercial sector, is an asset to the university, and helps explore science with students in grade school. It has been a continuing source of technology, information, trained individuals, and ideas for Alaska. And, it is an integral part of Alaska; it is not a branch of some organization elsewhere, returning the benefits outside.

Many of the direct benefits to Alaskans from the institute's activities have been described in this article. New benefits will accrue as we explore the resources of Alaska and apply our people and technology to its problems.

Now the institute needs help to continue to expand its work to meet state and national requirements. It needs financial assistance to construct an addition to its building for which the institute will later obtain maintenance and operating funds. The structure is planned to include several state and federal organizations who will help pay for the structure. In the tradition of the institute, the addition will be constructed with funds from several sources. There, the institute will carry out its mission in cooperation and collaboration with other groups with maximum efficiency and effectiveness, thus continuing its successful contributions to Alaska."

Geophysical Institute Field Sites in Alaska



Open House Attracts 3100 Visitors

A small girl with curly red hair stood on a stool so she could lean over a large silver ice chest. She wanted to watch Professor Glenn Shaw make magic. As he poured hot water over the ice crusted inside, her eyes grew wide.

"Mom, he did it," she yelled, jumping so hard she nearly flipped the chair. "He made a cloud . . . inside."

Shaw's simple Make-A-Cloud demonstration was one of more than a dozen presentations at the 1992 Geophysical Institute Open House. The weekend event attracted more than 3100 people from around the Interior, despite early October's bitter cold temperatures.

Geophysics isn't always easy to understand, or to explain. Just saying it's the study of natural processes occurring between the center of the earth and the center of the sun, doesn't mean much. That's why professors like Shaw have to do more than talk about it. They have to show it.

Colorful demonstrations about all aspects of geophysics were displayed on every floor of the seven-story Elvey building. Most displays achieved the impossible—they were simple enough to entertain children and factual enough to interest adults.

In the seismology lab, children jumped up and down on the floor to Make-A-Quake large enough to be recorded by a nearby seismometer. A few paces away, their parents watched as tremor was recorded by flickering silver arms that drew jagged black lines on paper attached to rotating helicorder drums. Several of those drums had been used to record earthquakes that helped predict the recent eruptions of Mount Spurr.

Upstairs, visitors listened to whistlers, pearls, and a dawn chorus—the sounds of plasma waves moving in radiation belts around the earth. They also learned about the ozone layer high above the earth, which protects life from harmful ultraviolet radiation. Scientists at the institute plan to install a device to measure atmospheric ozone on the top of the Elvey building this winter, in response to a federal study indicating an ozone hole may form above the Arctic.

Downstairs, visitors learned how scientists study the aurora using pictures of the northern lights captured on special film with television and satellite-imaging cameras. They also learned that basic research into the dancing lights has done more than produce pretty pictures. Scientists at the institute have studied the aurora for more than 23 years, with the help of more than 250 major sounding rockets launched from the university-owned Poker Flat Research Range. As a result of their basic research, power lines throughout the state can withstand induced electric currents during brilliant auroral displays and the trans-Alaska pipeline, a giant conductor for induced electrical currents, can better withstand corrosion.

In the institute basement, hundreds of children constructed their own miniature rockets, which were later launched outside. The results of their experiments could be calculated only in the smiles on their rosy faces.

On the institute's second floor, visitors learned how satellites are used to monitor the earth. Satellite data from the Alaska Synthetic Aperture Radar Facility are used to map resources around the state, and to monitor sea ice that may someday indicate global climate change. Data also are used to monitor and to help with major catastrophic events in Alaska, like forest fires, erupting volcanoes, and oil spills in oceans near coastal areas. Last year, satellite images were used to help commercial ships weave through ice in the northeast and northwest passages. Years ago, research in radio physics at the institute demonstrated that satellite communication could be used to get health and other advisory services to isolated rural communities in Alaska. This activity became the basis for today's statewide satellite telephone system.

During "Fins Away! A Counting Tale," visitors got to see the equipment Electronic Shop Supervisor John Benevento used as part of the sonar method he invented to count salmon escapement quickly and accurately. His device already has been field tested and promises to bolster the state's commercial fishing industry.

Visitors more interested in frozen rivers walked through a display that showed glaciers both growing and shrinking, and got some solid tips on how to design buildings and roads on frozen ground at a permafrost display down the hall.

Elsewhere, rock collectors watched slides showing what it's really like to live in a geologist's field camp in the Arctic National Wildlife Refuge for weeks on end. Work in field camps has provided a framework for evaluating potential resources in ANWR by reconstructing the geologic history of the Brooks Range.

Blast off— *The first of six model rockets is launched during a demonstration at the GI Open House. More than 250 people attended model rocket workshops headed by Assistant Professor Neal Brown.*

Photo by Dan Hyde, Fairbanks Daily News-Miner

GI NOTES

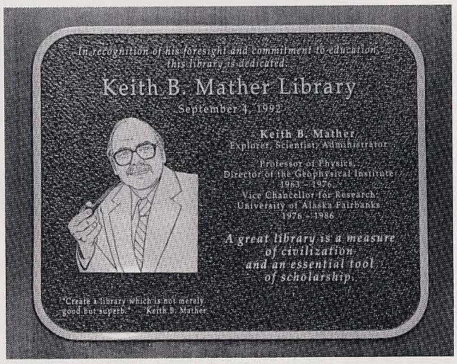
A record number of graduate students are enrolled at the Geophysical Institute. At press time, 39 students were working toward their master's degrees; another 54 were aiming toward their doctorates, and a bumper crop of applicants await the chance to study here. All we need now is somewhere to put them . . .

Directory of doctors available

After two years of effort directed by Jeanne Hume, the Geophysical Institute Ph.D. Directory 1955-1991 is available. The directory provides brief professional biographies and recent photos of the 88 graduates who earned doctorates from the institute. Dr. Masahisa Sugiura ('55, Space Physics; presently a professor at Tokai University, Tokyo) heads the list with the first Ph.D. awarded by the University of Alaska. His fellow graduates worked all over the globe during the past 36 years, in academia and in government, in private industry and in public service. Copies are available from the Director's Office, Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK 99775-0800.

Library named for past director

Keith Mather, director of the Geophysical Institute from 1963 to 1976, returned briefly from his Oregon retirement for a September 4 ceremony dedicating the institute library in his honor. Among his many accomplishments as director (and later as the university's vice chancellor for research), Mather battled for and secured the state and federal funds needed to construct the institute's C. T. Elvey Building. He insisted on the importance of the library as a powerful and necessary tool for successful research, and committed the resources necessary to create the unique collection of research materials now in the library. As

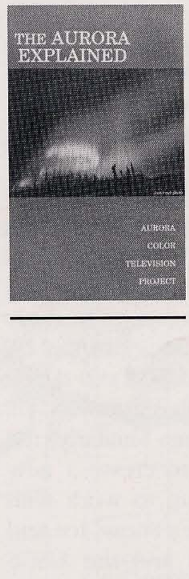


he predicted, the Geophysical Institute library is an invaluable asset to research for the institute staff, to the scientific and technical community in Alaska, and to visiting scholars.

Speaking at the dedication ceremony were Associate Director for Institute Relations Merritt Helfferich, who served as master of ceremonies, UAF Chancellor Joan Wadlow, Geophysical Institute Director Syun Akasofu, Professor Emeritus Neil Davis, who served as deputy director under Mather, and Julia Triplehorn, institute librarian. A bronze plaque dedicating the library to Mather was unveiled during the ceremony.

New video explains the aurora

and shows it off beautifully. Seven years ago, Geophysical Institute personnel designed a videotape of auroras over Alaska. The video had background music, but no captions or voices. Ever since, people have pestered the group to do another videotape explaining the shimmering lights. Now they've done it. With Dan Osborne serving as point man for the team, helped chiefly by Tom Hallinan, Neal Brown, Gina Price, and Sheila Finch, *The Aurora Explained* appeared just in time for Christmas 1992. The scientists appear on-camera, using props from pinball machines to aluminum lawn edging to help provide explanations "understandable for an eighth-grader but not boring for a Ph.D.," according to Brown. The institute's TV camera is the off-screen star of the show. Its supersensitivity to light enabled the true colors and motions of auroras to be captured with extraordinary accuracy, which is vital for research data collection and delightful for casual video viewers. The 28-minute tape can be purchased through the University of Alaska Press, solo, or with *The Aurora Watcher's Handbook*, written by institute Professor Emeritus Neil Davis. The videotape alone costs $34.00, including shipping and handling; with the book, it's $48.00. Queries or orders should be sent to the University of Alaska Press, University of Alaska Fairbanks, Fairbanks, AK 99775, or call (907)474-6389, or FAX (907)474-7225.



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